WE have recently received the annual report for 1898–99 of the Bacteriologist of the Government of India. The report deals chiefly with experiments on Rinderpest carried on in the laboratory at Muktesar, a preliminary note of which appears. The methods of protective inoculation that are used in South Africa are not convenient for a country like India; Koch's method of using bile from an animal just killed, requiring the slaughter of many animals, is contrary to the religious susceptibilities of the people. The disease, which has been in India for centuries, seems to be of an endemic character, and not liable to spread with the same alarming rapidity as it does in South Africa, so it does not seem all-important to produce a very lasting immunity to check the disease in any particular locality. Since the disease will probably have been going on for some time in a place before measures can be adopted, a rapidly immunising agent is desirable. The serum method seemed to be the most fitted to the purpose, and it is this that is being tried. It is a great loss that the laboratory at Muktesar, the only Government laboratory anything like properly equipped, has recently been burnt down, but we trust no time will be lost in rebuilding it; India at the present time can ill-afford to do without laboratories.

WHETHER ants can hear is a question which has for some time been engaging the attention of Mr. Weld, of the Iowa University, who has published an account of some of his experiments, and the conclusions he draws from the same, in *Science* of November 24. He states that for many years it has been the accepted opinion amongst naturalists that these insects are not endowed with an acoustic sense, at least within the range of sounds perceptible to the human ear. This opinion is based upon the failure of experiments to show that even the loudest and shrillest noises produce the slightest effects on ants subjected to their influence. This, however, is not the result of Mr. Weld's experiments upon several American species of these insects. In one case an ant confined in a test-tube was brought near a milled disc rotating in the air. At each sound from this apparatus the ant showed unmistakable signs of agitation, quickly moving its head and antennæ. Again, when shrill sounds were produced close to a colony protected under glass, the ants instantly showed by their rapid movements signs of excitement and alarm. This leads the experimenter to conclude that at least some (and possibly only American) species of ants are capable of perceiving vibrations, conducted through the air or other media, which are audible as sound to the human ear. He is, however, careful to add that this does not necessarily demonstrate that they hear in the strict sense of the word, but merely that they are capable of perceiving ordinary sound vibrations.

IN the course of an article on the late Mr. P. H. Gosse, published in the March number of the *Journal of the Jamaica Institute*, Mr. Duerden has some interesting observations on recent changes in the fauna of that island. He first of all states that in spite of its being less abundant around country residences, the Indian mungoose appears to be as common as ever in the island, over 1400 head having been trapped on two estates in eight weeks. His next subject is ticks, which have become a terrible plague in certain districts. Although they always existed, originally there appears to have been but one species in the island, but many others have been introduced on foreign cattle and sheep. A few years ago a virulent disease broke out in the cattle, which was at first diagnosed as being allied to the well-known "Texas fever." Subsequently the characteristic symptons of that disease were found to be absent, as were the well-known parasitic organisms by which it is accompanied; but there still seems no doubt that the bovine epidemic is in some way connected with the presence of myriads of introduced ticks.

IN a second communication to the same journal, Mr. Duerden gives the results of the attempts to improve the sea-fisheries of Jamaica. Unfortunately these attempts have not met with the success that was hoped for. The two chief reasons for the failure—and they are amply sufficient—are, firstly, the amount of coral on the sea-bottom, which renders trawling impracticable; and, secondly, a general scarcity of fish, especially those of the valuable flat-fish group (*Pleuronectidae*) On one place where trawling is practicable, it was considered a remarkable feat that a dozen small soles were taken in a day. There are no shoals of fish corresponding to those of the herring, mackerel, and cod of other seas; so that the whole outlook is gloomy in the extreme.

THE *American Naturalist* for November contains the fifth instalment of Messrs. Cowstock and Needham's important contributions to the study of the structure of the wings of insects, for the details of which we must refer our readers to the memoir itself.

MESSRS. FRIEDLÄNDER AND SON, Berlin, have just issued a catalogue (No. 439) containing classified lists of books and papers on crystallography.

MESSRS. DAWBARN AND WARD have published the third edition of Dr. P. H. Emerson's "Naturalistic Photography." The first part is concerned with the æsthetic side of photography, but in the second part technique and practice are treated, and from it both amateur and professional photographers may derive sound philosophy and serviceable hints.

IN the part just received (1899, 1te Hälfte) of the *Sitzungsberichte* of the Niederrheinische Gesellschaft für Natur und Heilkunde zu Bonn, the most important papers are by Dr. Max Koernicke on the spiral thickening bands in the conducting tubes of plants; and by Prof. W. Voigt on artificial regeneration in Planaria.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*, ♀) from India, presented by Mr. F. G. Stenning; a Lesser White-nosed Monkey (*Cercopithecus petaurista*) from West Africa, presented by Mr. R. Caton Woodville; two Hobbys (*Falco subbuteo*), captured in the Indian Ocean, presented by Mr. J. H. Ingram; a Fieldfare (*Turdus pilaris*), British, presented by Mr. Herbert Goodchild; a Delaland's Gecko (*Tarentola delalandii*) from Teneriffe, presented by Mr. J. Chappell; a Mozambique Monkey (*Cercopithecus pygerythrus*) from East Africa, a Bee-eater (*Merops apiaster*), a Partridge (*Perdix cinerea*), European; two Brown's Parrakeets (*Platycercus browni*) from North Australia, a —— Tortoise (*Testudo nigrita*) from the Galapagos Islands, three Blanding's Terrapins (*Emys blandingi*) from North America, deposited; a Yellow-footed Squirrel (*Sciurus ludovicianus*) from Texas, a Tufted Duck (*Fuligula cristata*), European; two Common Scoters (*Œdemia nigra*), British, purchased.

OUR ASTRONOMICAL COLUMN.

ORBIT OF FIFTH SATELLITE OF JUPITER.—Prof. E. E. Barnard has had the fifth satellite of Jupiter under close observation for some considerable time during the oppositions of 1898 and 1899. Although the increasing southerly declination and the bad season in which the oppositions now occur make the satellite a difficult object, good measures have been secured on several dates. Tisserand having drawn attention to the fact that the measures previously given provided evidence of the eccentricity of the satellite's orbit (*Comptes rendus*, vol. cxix.,

October 8, 1894), Prof. Barnard decided to observe it as continuously as possible, to settle this question. Tisserand's results indicated that the line of apsides of the satellite's orbit should also have a motion of + 882° a year, or + 2°·42 daily, giving a complete revolution in five months. From the Lick measures he computed the semi-major axis of the orbit to be 47″·906, the eccentricity 0·0073, and longitude of Perijove for 1892, November 1, = − 4°. Prof. Barnard's more recent measures enable him to revise these values, and his results are contained in the *Astronomical Journal*, No. 472. On calculating the position of the satellite from Tisserand's value of the motion, a considerable error is found, and the daily motion of the apse line is probably more nearly + 2°·465 or 900° yearly, giving a complete revolution of the orbit in 4·9 months.

An interesting question that may also be settled by continued observation of the satellite is the distribution of matter at the equator of Jupiter itself, as the motion of the perijove of the satellite does not agree with that deduced from the actual polar compression of the planet.

During the whole of the measures half the field of view was covered with a piece of smoked mica, through which the bright limb of the planet was observed, and the distances measured from the limb afterwards reduced to the centre by previous measures of the planet's diameter with the same instrument. The increased number of elongations measured gives a much more correct value of the period. The value now given is

11h. 57m. 22·647s.,

which Prof. Barnard considers correct to one-hundredth part of a second.

PARTIAL ECLIPSE OF THE MOON, DECEMBER 16.—There will be a partial eclipse of the moon, visible at Greenwich, during the early morning of Sunday next, in respect to which the following particulars apply:—

First contact with penumbra = 10h. 33·7m.; with shadow = 11h. 44·6m.

Second contact with penumbra = 16h. 18·1m.; with shadow = 15h. 17·2m.

Magnitude of eclipse (moon's diameter = 1) = 0·995.

First contact with shadow occurs at a point 66° from the north point towards the east, measured along the moon's limb.

Last contact with shadow at a point 59° from north point towards the west.

The eclipse is visible in Western Asia, throughout Europe and Africa, and in Eastern America.

OCCULTATION OF NEPTUNE, DECEMBER 16.—There will be another occultation of Neptune during the early morning of Sunday, while the moon is still in the penumbra of the earth's shadow after the partial eclipse. The following are the particulars for observers near London:—

	Sidereal time.	Mean time.	Angle from North Point.	Angle from Vertex.
	h. m.	h. m.	°	°
Disappearance...	9 18	15 36	158	118
Reappearance ...	9 53	16 11	222	180

Greenwich Mean Time of conjunction in R.A.... } 1899 December 16d. 14h. 53m. 15s.

Limits of latitude, 90° N. to 30° N.

Neptune passes the meridian of Greenwich at 13h. 40m., so that it will be well situated for observation of the occultation.

MERIDIAN OF UNIVERSAL TIME.—In the *Revue Scientifique*, Ser. 4, vol. 12, p. 526, M. C. Tondini di Quarenghi summarises most of the evidence in favour of and against the adoption of the meridian of Greenwich as the initial meridian for universal time. The chief objection is cited as a physical one, viz., the extreme uncertainty of the meteorological conditions, rendering celestial observations impossible on a large proportion of the days and nights throughout the year. The advantages of the site at Jerusalem suggested by the Italian Government are the superior observing conditions and the possibility of the district being declared neutral ground, thus ensuring the permanence of the station irrespective of political changes. A further advantage would be the possibility of establishing other subsidiary stations at intervals along the meridian.

THE DEVELOPMENT OF GANGLION-CELLS AND NERVES.[1]

THE results of this memoir largely are in keeping with certain revolutionary changes in embryological doctrine, with which the names of Klaatsch, Miss Julia Platt, Goronowitsch and others are identified. According to their views certain vertebrate structures, which have hitherto been genetically referred wholly or in part to the mesoderm, such as scales, certain cartilages, and even bones, are in fact directly or indirectly products of the outer layer of the embryo, the ectoderm or epiblast. This is only a brief and very general statement of the tendency of their lines of research, and it may be added that as to the details there exist important differences between the different observers. It will not be needful to review all their conclusions here. Our concern is solely with the aspect of the question presented to us by Dr. Goronowitsch in his memoir.

Researches on the development of nerves and ganglia date back to Remak, whose conclusions as to their mesoblastic origin from the protovertebræ or mesoblastic somites were commonly held as recently as twenty-five years ago. About then date the researches of Balfour and Marshall, who maintained that these structures arose as outgrowths of the central nervous system, and that therefore they were epiblastic in origin.

Later on their conclusions were somewhat modified by Beard, in the discovery that the posterior root-ganglia, both cranial and spinal, did not develop as actual outgrowths from the central organ, but that their foundations were to be traced to the deeper portions of the epiblast outside the limits of the future brain and spinal cord. It was also demonstrated that the cranial ganglia received additions from special regions of sensory epiblast, since termed by Kupffer "placodes," on the level of the notochord and above the gill-clefts. Thus, for the sensory portion of each cranial ganglion, two sources of origin could be identified, and the parts so derived were termed neural and lateral respectively. A few years ago Kupffer added a third source, and described an "epibranchial" ganglionic foundation as arising from it. Kupffer's results were obtained in the lamprey, unquestionably one of the most difficult forms among vertebrate animals for the study of organogeny. His results have never been confirmed by any other observer, either in the lamprey or in any other vertebrate.

Whilst it is certain that his epibranchial ganglia have no existence in Elasmobranch fishes, it is also in embryos of these easily demonstrated how Kupffer fell into the error of supposing their presence. In fine, had his researches been carried to sufficiently early "stages" or phases he would have seen that his lateral and epibranchial ganglia merge into one, the foundation of a lateral ganglion.

Since Kupffer's researches were fully published in 1894–5, embryological investigation of the development of cranial and spinal nerves and ganglia has been put somewhat in the shade by brilliant researches into their comparative anatomy at the hands of Allis, Dixon, Ewart, Fürbringer, Haller, Strong and F. J. Cole. Pages and pages might be filled in review of these, along with a critical digest of numerous other papers, embryological and morphological, issued since 1885. Controversies have been waged as to the morphological nature of certain nerves and ganglia, as to their mode or modes of development, and as to the way—apparently a simple problem, but by no means such—in which nerve-fibres arise.

The work under review is only in a minor degree a contribution to a knowledge of the morphological nature of nerves, *i.e.* in so far as it relates to the olfactory and auditory nerves. On the other hand, it emphatically claims to furnish decisive replies to the two latter questions, as to the mode or modes of development of ganglia and of nerve-fibres. If the conclusions drawn by Goronowitsch from his researches can be upheld, it would seem to follow that the investigations of the past twenty-five years—except those of Sedgwick—have been largely in vain.

According to Dr. Goronowitsch, what Balfour and Marshall regarded as outgrowths of the central nervous system, and termed "the neural ridges," have nothing to do with the development of the cranial ganglia. The existence of these "ridges" of cells he does not dispute, but he maintains that the component cells become resolved into the surrounding meso-

[1] Untersuchungen über die erste Anlage der Kranialnerven bei *Salmo fario*." By N. Goronowitsch. Nouveaux Mémoires de la Société impériale des Naturalistes de Moscou, T. xvi. L. 1, pp. 1-55, 3 plates.